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which preceded his departure from England, he studied with unremitting ardour and perseverance for no less than eighteen hours each day ; and, conquering every difficulty, acquired a competent knowledge of the principles of science, learned the uses of various instruments, and made himself thoroughly master of the methods of taking observations both at sea and on land.

The narrative proceeds to notice the arrival of Mr. Douglas in America, the progress of his undertaking, the loss of his collections and most of his books and papers, by the upsetting and dashing to pieces of the canoe in which he attempted to pass the rapids, and, lastly, his death in 1833, at Owhyhee, in the Sandwich Islands, whither he had proceeded on his return to Europe.

The books which were preserved, and which have been received by Major Sabine, consist of several volumes of Lunar, Chronometrical, Magnetical, Meteorological and Geographical observations, together with a volume of field sketches. The geographical observations of latitude and longitude refer to two distinct tracts of country ; first, the Columbia river, and its tributaries ; and the district to the westward of them : and, secondly, California. Mr. Douglas very judiciously selected the junctions of rivers, and other well characterized natural points, as stations for geographical determination. The papers containing the details of his magnetical inquiries comprise records of observation of the dip, and of the intensity, at various stations both in North America and in the Sandwich Islands.

“Analysis of the Roots of Equations.” By the Rev. R. Murphy, M.A. Communicated by John William Lubbock, Esq., F.R.S.

The object of this memoir is to show how the constituent parts of the roots of algebraic equations may be determined by considering the conditions under which they vanish ; and, conversely, to show the signification of each such constituent part.

The following are the propositions on which the author's investigations are founded.

1. In equations of degrees higher than the second, the same constituent part of the root is found in several places, governed by the same radical sign, but affected with the different corresponding roots of unity as multipliers.
2. The root of every equation, of which the coefficients are rational, contains a rational part ; for the sum of the roots could not otherwise be rational. This rational part, as such, is insusceptible of change in the different roots of the same equation ; consequently its value is the coefficient of the second term, with a changed sign, divided by the number of roots, or index of the first term.
3. The supposed evanescence of any of the other constituent parts, implies that a relation exists between the roots ; and if such a relation be expressed by equating a function of the roots to zero, that constituent part will be the product of all such functions, and a numerical factor.
4. The joint evanescence of various constituent parts, implies the coexistence of various relations between the roots, and that an in-

terpretation may be given to each of the constituent parts, riveting the expression of the root in the memory, and converting the solution of a problem into a condensed enunciation of various theorems. The author exhibits the application of these principles to equations of various degrees, beginning with quadratic and cubic, and proceeding to those involving higher powers.

“On the first changes in the Ova of the Mammifera, in consequence of Impregnation; and of the mode of origin of the Chorion.” By Thomas Wharton Jones, Esq. Communicated by Richard Owen, Esq., F.R.S.

The author having, in a former paper, described the structure of the unimpregnated ovum of mammiferous animals, now proceeds to investigate the changes which the ovum undergoes in consequence of impregnation. In the rabbit, the first perceptible difference is the addition of a thick gelatinous matter surrounding the parts of which the ovum was composed in its original state, and apparently derived from the ovaries. In the progress of development the vitellary membrane gives way, as happens in the ova of the newt, and of many of the oviparous animals. The gelatinous envelope acquired in the ovary, and which is more especially circumscribed and defined after impregnation, constitutes the only covering of the vascular blastoderma, after the giving way of the vitellary membrane, and afterwards forms the chorion, which in rodent animals, at a further stage of development, presents itself under the form of a thin and transparent membrane, very similar to the vitellary membrane of a bird's egg, and situated immediately outside the non-vascular and reflected layer of the umbilical or erythroid vesicle. The author draws similar conclusions with regard to the development of the human ovum.

The second part of the paper relates to the changes taking place in the vitellus, the inferences concerning which are deduced chiefly from observations of the development of the ova of batrachian reptiles. The author concludes that the disappearance of the germinal vesicle is prior to impregnation. In the newt, the vesicle, at first imbedded in the substance of the yelk, gradually approaches the surface, until its situation is immediately underneath the vitellary membrane: its coat, having now become very soft, gives way, allowing the contained fluid to be effused on the surrounding surface of the yelk; and the small depression in which the vesicle was lodged now forms the cicatrix. The effused fluid gives a degree of consistence to the matter composing the surface of the yelk, and thus promotes the formation of the blastoderma. In the frog, the surface of the yelk becomes every day more and more broken up, and the resulting crystalline forms described by Prevost and Dumas become smaller and smaller, until the surface of the black blastoderma appears under a magnifying glass like shagreen. The blastoderma, consisting of an aggregation of clear globules, different from those of the rest of the yelk, is now fully formed, and has extended itself so as to close in the white spot. The change which takes place in the yelk of the bird's egg appears to be limited to the neighbourhood of the cicatrix.